Breast reconstruction rate and profile in a Singapore patient population: a National University Hospital experience

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ABSTRACT

Introduction: Breast reconstruction is an integral part of breast cancer management, with the aim of restoring a breast to its natural form. There is increasing awareness among women that it is a safe procedure and its benefits extend beyond aesthetics. Our aim was to establish the rate of breast reconstruction and provide an overview of the patients who underwent breast reconstruction at National University Hospital (NUH), Singapore.

Methods: We evaluated factors, such as ethnicity, age, time and type of implant, for their impact on a patient’s decision to proceed with breast reconstruction. We retrospectively reviewed the medical records of women who had breast cancer and underwent breast surgery at NUH between 2001 and 2010.

Results: The breast reconstruction rate in this study was 24.3%. There were 241 patients who underwent breast reconstruction surgeries (including delayed and immediate procedures) among 993 patients for whom mastectomies were done for breast cancer. Chinese patients were the largest ethnic group who underwent breast reconstruction after mastectomy (74.3%). Within a single ethnic patient group, Malay women had the largest proportion of women undergoing breast reconstruction (60.0%). The youngest woman in whom cancer was detected in our study was aged 20 years. Malay women showed the greatest preference for autologous tissue breast reconstruction (92.3%). The median age at cancer diagnosis of our cohort was 46 years.

Conclusion: We noted increases in the age of patients undergoing breast reconstruction and the proportion of breast reconstruction cases over the ten-year study period.

Keywords: breast, breast reconstruction, mammoplasty, reconstruction
INTRODUCTION

Breast cancer is the most common malignancy among women in Singapore (29%)(1) and worldwide (25%).(2) Breast reconstruction is now an integral part of breast cancer management,(3,4) which aims to create a symmetrical natural-looking breast mound. Since the first attempt at breast reconstruction by Vincent Czerny in 1895,(5) many techniques and methods have evolved to modern-day standards of safety and aesthetics. Now, the complete treatment of breast cancer surgery with reconstruction allows two different goals of breast cancer management to be achieved – oncologic management and aesthetic restoration. The increasing popularity of breast reconstruction can be attributed to factors such as improvements in surgical techniques, changes in patient attitudes and preferences.

Studies have also shown that the choice of breast reconstruction varies substantially by ethnicity. This is seen especially in the United States.(6-8) Unlike many of its Southeast Asian counterparts, Singapore has a multiethnic population composed primarily of four ethnic groups: Chinese (74.3%); Malay (13.4%); Indian (9.1%); and other ethnicities (3.2%).(9) In such an ethnically diverse population, the effect of various epidemiological factors has not been well studied in Singapore. Currently, breast reconstruction figures in the Southeast Asian region are lacking and local data is also unavailable.

Our study aimed to establish the rate of breast reconstruction and provide an overview of those who underwent post-mastectomy breast reconstruction at National University Hospital (NUH), Singapore, a key institute that provides specialist services for breast reconstruction in Singapore.
METHODS
This retrospective study was carried out on all women who were diagnosed with breast cancer and underwent surgeries (mastectomy and subsequent breast reconstruction procedures) at NUH over a ten-year time period (2001–2010).

Patient information was collected from NUH’s main clinical information system (or the Computerized Patient Support System [CPSS®]), scanned medical records and clinical files. The list of patients was generated from the NUH breast cancer registry database. Data of interest included total number of reconstruction cases in each year and patient sociodemographics, such as age and ethnicity (Chinese, Malay, Indian or other ethnicities). Data collection was done with approval from the National Healthcare Group Domain Specific Review Board (NHG DSRB). Computer software for statistical calculations, such as IBM SPSS Statistics version 22.0 (IBM Corp, Armonk, NY, USA), was used to generate the breast reconstruction rate.

RESULTS
Among 1,686 surgeries performed, 993 were mastectomies and 693 were breast-conserving surgeries (BCSs) (Table I). Of the 993 mastectomies, 241 procedures were for breast reconstruction (which included both immediate and delayed procedures). The overall breast reconstruction rate at NUH from 2001 to 2010 was 24.3% (241/993 patients).

Figs. 1 and 2 demonstrate the ethnic distribution of the overall cohort of women who underwent surgeries for breast cancer treatment and those who underwent BCS, respectively. The ethnic distributions of these two patient groups were similar to patients who underwent subsequent breast reconstruction (Fig. 3). Women of Chinese ethnicity constituted the largest ethnic group of patients undergoing breast reconstruction at 74.3% (Fig. 3).
Out of 241 breast reconstruction procedures, the majority (n = 233) were immediate breast reconstruction; eight patients underwent delayed reconstruction. For all eight patients with delayed reconstruction, these procedures were performed within the ten-year time frame (Table II).

**Table II. Patients who underwent breast reconstruction by duration.**

<table>
<thead>
<tr>
<th>Duration</th>
<th>No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Immediate</td>
<td>233</td>
</tr>
<tr>
<td>Delayed</td>
<td>8</td>
</tr>
<tr>
<td>&lt; 1 yr</td>
<td>1</td>
</tr>
<tr>
<td>2 yr</td>
<td>2</td>
</tr>
<tr>
<td>3 yr</td>
<td>1</td>
</tr>
<tr>
<td>4 yr</td>
<td>1</td>
</tr>
<tr>
<td>5 yr</td>
<td>2</td>
</tr>
<tr>
<td>7 yr</td>
<td>1</td>
</tr>
</tbody>
</table>

There was an increase in the number of patients undergoing breast reconstruction over the years, from ten patients in 2001 to 44 patients in 2010 (Fig. 4). There was a corresponding increase in the proportion of breast reconstruction, from 8.1% in 2001 to 41.1% in 2010.

Within a single ethnic patient group, Malay women had the largest proportion of women undergoing breast reconstruction at 60.0% (Fig. 5). The corresponding proportion of women among Chinese, Indian and other-ethnicities patients were 25.1%, 7.6% and 16.9%, respectively. Similarly, within a single ethnic patient group, Malay women showed the greatest preference for autologous tissue during breast reconstruction (92.3%) (Fig. 6). The corresponding proportion of women among Chinese, Indian and other-ethnicities patients were 80.4%, 72.7% and 91.7%, respectively.

The median age of all patients who underwent breast reconstruction was 46 years (Fig. 7). The higher proportion of Malay women noted earlier among women undergoing breast reconstruction within a single ethnic patient group was correspondingly associated with a significantly younger median age at cancer detection (40 years) among Malay patients. In
comparison, patients of other ethnic groups, such as Chinese (47 years), Indian (45 years) and other ethnicities (44.5 years) had a higher median age at cancer diagnosis (Fig. 8).

Over the ten-year study period, an increase was noticed in the age of women who underwent breast reconstruction. This was depicted by a relatively lower median age (40.5 years) in 2002 and a relatively higher median age (49 years) in 2009 (Table III).

DISCUSSION

To our knowledge, this is among the first studies to describe the rate of breast reconstruction at a large institution in Singapore. Our findings provide an overview of the profile of patients who underwent breast reconstruction surgery at NUH between 2001 and 2010.

The overall reconstruction rate at NUH was higher than other reports from Asia for a comparable time period. The reconstruction rate at NUH was 24.3% in our study. The Korean Breast Cancer Society reported a 16.0% breast reconstruction rate in 2008 in Korea.\(^{(10)}\) Oda et al reported an immediate breast reconstruction rate of 11.2% in 2010 in over 1300 hospitals in Japan.\(^{(11)}\) On the other hand, our breast reconstruction rate was comparable to that reported in Western populations. In the United States, for instance, the breast reconstruction rate was 24.8% and 29.2% in 2003 and 2007, respectively.\(^{(12)}\)

There was also a yearly increase in the percentage of breast reconstructions – a fivefold increase in the rate of breast reconstruction was seen, from 8.1% in 2001 to 41.1% (n = 44) in 2010. The year 2010 saw the largest percentage of women undergoing breast reconstruction, which correlates with increased participation of women in the Singapore labour force, rising from 40.1% in 1999 to 43.8% in 2010.\(^{(13)}\) This finding may suggest that women are increasingly able to support themselves and their healthcare needs financially.

This rising trend could also be attributed to increasing awareness of the benefits of breast reconstruction. Technological advancement has allowed women more convenient access
to information on the Internet and even advocacy groups, such as the Singapore Breast Cancer Foundation. We believe that women in Singapore have increasing levels of health literacy and comprehension of complex medical information. Hence, they may have greater knowledge of the psychological, emotional and aesthetic benefits of breast reconstruction.

In Singapore, a multidisciplinary approach to the management of breast cancer is adopted to optimise surgical recovery and results. This is seen in specialist centres, such as NUH. Locally, breast surgeons also work closely with plastic surgeons in co-managing patients with breast cancer. We believe that surgeons’ attitudes and practice methods are important sources of variation for breast reconstruction rates, as it would affect their tendency to refer their patients to a plastic surgeon. This was noted in a local study by Lim et al.\(^\text{[14]}\) and also by Hawley et al.\(^\text{[15]}\)

This close working relationship between breast surgeons and plastic surgeons in Singapore could explain the high breast reconstruction rate in our city-state, as compared to large countries, where the availability and distribution of medical resources are likely to vary geographically. Patients in Singapore have equal and convenient access to multidisciplinary healthcare. On the other hand, patients in larger countries may be subject to differing regional policies or lack access to plastic surgery services in more rural areas. This has been reported in Japan,\(^\text{[11]}\) England\(^\text{[16]}\) and Canada.\(^\text{[17]}\) A future survey of patients in Singapore would be helpful in delineating the relationship between surgeon referrals and ease of access to healthcare services and breast reconstruction.

Age has been widely reported as a predictor of breast reconstruction for women undergoing mastectomy for breast cancer.\(^\text{[18-20]}\) It is commonly thought that younger women tend to be more affected by the loss of their breasts and are more likely to receive reconstruction,\(^\text{[21]}\) whereas older women, particularly of Asian descent, have low demands for their body image.\(^\text{[22]}\)
We have found that the median age of reconstruction in our cohort was 46 years, with a majority of patients in the reconstructive group being older than 46 years. This trend parallels breast cancer demographics locally and regionally, where a majority of patients with breast cancer are aged 45 years and above.\(^{1,23}\) Our findings may dispel the popular belief that younger women prefer reconstruction to older women.

Lipa et al showed encouraging data with regard to autologous reconstruction in older patients aged over 65 years.\(^{24}\) Veronesi et al found acceptable rates of complications even with longer operating times, prolonged anaesthesia and greater fluid shifts.\(^{25}\) No significant difference was noted for minor or major complications in the postoperative period by Ludolph et al.\(^{26}\) Similar data was reported by Veronesi et al for implant-based reconstruction in older patients.\(^{25}\)

It is possible that, at a later stage of life, fewer women consider breast reconstruction important. With a complex operative procedure for autologous reconstruction, possible comorbidities and prolonged recovery periods in older patients, there are concerns that the risks might outweigh the benefits of reconstruction for older patients. However, our data showed an increase in the median age of reconstruction from 2001 (45.5 years) to 2010 (48 years), with the greatest age at 49 years seen in 2009. Does this suggest that increasing age is becoming less significant in the decision against breast reconstruction for both patient and surgeon? A deeper and more extensive survey of our patient population might be necessary for a more comprehensive understanding of such associations.

We found that the largest proportion of patients who underwent reconstruction was ethnically Chinese (74.3%), followed by Malay (16.2%), of other ethnicities (5.0%) and Indian (4.6%). This difference is likely related to the disease pattern and ethnic composition of breast cancer in the local population, which was found to be: Chinese (80.8%), Malay (11.3%), other ethnicities (2.0%) and Indian (5.9%).\(^{1}\)
The uptake of reconstruction among Indian women was 7.6% in our study, which was the lowest among all ethnic groups. We postulate that information on breast reconstruction regarding this aspect may not be widely disseminated; hence, further study is warranted.

Within patients of a single ethnic group, the largest proportion of patients who underwent reconstruction was seen among Malays (60.0%). This could be explained by the earlier diagnosis of breast cancer among Malay women. Further analysis of our cohort showed that the median age at cancer diagnosis for Malay patients was 40 years, which was the lowest among all ethnic groups. According to local cancer demographics, the median age at diagnosis for Malays is 46 years, which is also the lowest among the various ethnic groups, with Chinese patients at 51 years and Indian patients at 53 years.\(^1\) Regional studies have also found that Malay women tend to be diagnosed with breast cancer at a younger age with larger tumours and later stages than Chinese and Indian women.\(^27\) The development of breast cancer is multifactorial. Genetic and environmental factors may play a role in predisposing Malay women to developing breast cancer at a younger age. Further epidemiological and biochemical studies may be relevant in elucidating this predisposition.

Similar to a study by Simpson et al on the incidence of breast cancer among Filipino women in Canada,\(^28\) our finding may have a profound effect on future screening mammography guidelines and the ideal age to start screening for breast cancer for women of Malay descent. According to current clinical practice guidelines in Singapore, all women aged 50–69 years are encouraged to attend yearly breast cancer screening.\(^29\)

The greatest proportion of women who underwent autologous breast reconstruction in our study was for Malay patients (92.3%), with the remaining 3 of 39 Malay patients (7.7%) undergoing implant reconstruction. Within the other ethnic groups, 72.7% of Indian patients, 80.4% of Chinese patients and 91.7% of patients of other ethnicities underwent autologous breast reconstruction.
The significantly high percentage of Malay patients who underwent autologous reconstruction over implant reconstruction suggests of the impacts of culture and religion on medical perspectives. Women of different ethnic backgrounds bring different sets of cultural beliefs and expectations. Our results suggest complex dynamics between cultural and religious preferences that affect a patient’s decision to undergo reconstruction and the type of material used for that reconstruction.

Our study only included patients who underwent both breast resection and reconstruction surgeries at NUH. Future analysis could integrate study populations from other surgical institutions in Singapore to obtain a more representative finding of the local population. This was a retrospective study, and therefore we were unable to establish causality. Instead, we drew conclusions based on associations between the factors known for our cohort and breast reconstruction.

In conclusion, this present study provided an overview of the profile of patients who underwent breast reconstruction at a tertiary institution in Singapore. The information garnered has provided us with a better understanding of the factors that may be associated with a patient’s decision to undergo reconstruction. This study provides a platform for future epidemiological research to establish factors that are associated with post-mastectomy breast reconstruction.
ACKNOWLEDGEMENT

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REFERENCES


Table I. Patients who underwent breast cancer surgery by ethnicity.

<table>
<thead>
<tr>
<th>Variable</th>
<th>No. (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Chinese</td>
</tr>
<tr>
<td>Breast cancer surgery (n = 1,686)</td>
<td>1,205 (71.5)</td>
</tr>
<tr>
<td>Breast-conserving surgery (n = 693)</td>
<td>493 (71.1)</td>
</tr>
<tr>
<td>Mastectomy (n = 993)</td>
<td>712 (71.7)</td>
</tr>
<tr>
<td>Breast reconstruction post-mastectomy (n = 241)</td>
<td>179 (74.3)</td>
</tr>
<tr>
<td>Autologous tissue (n = 199)</td>
<td>144 (72.4)</td>
</tr>
<tr>
<td>Implants (n = 42)</td>
<td>35 (83.3)</td>
</tr>
<tr>
<td>Age at cancer diagnosis of women undergoing breast reconstruction</td>
<td></td>
</tr>
<tr>
<td>Mean age (yr)*</td>
<td>47.63 ± 8.74</td>
</tr>
<tr>
<td>Median age (yr)</td>
<td>47</td>
</tr>
</tbody>
</table>

*Data presented as mean ± standard deviation.

Table III. Patients undergoing breast cancer surgery by year during the ten-year study period.

<table>
<thead>
<tr>
<th>Variable</th>
<th>No. (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2001</td>
</tr>
<tr>
<td>Mastectomy (n = 993)</td>
<td>123</td>
</tr>
<tr>
<td>No subsequent breast reconstruction (n = 753)</td>
<td>113</td>
</tr>
<tr>
<td>Subsequent breast reconstruction (n = 241)</td>
<td>10</td>
</tr>
<tr>
<td>Median age of women who underwent breast reconstruction (yr)</td>
<td>45.5</td>
</tr>
</tbody>
</table>
FIGURES

Fig. 1 Pie chart shows ethnic distribution (no. [%]) of women who underwent surgeries for breast cancer treatment (n = 1,686).

Fig. 2 Pie chart shows ethnic distribution (no. [%]) of women who underwent breast-conserving surgery (n = 693).
Fig. 3 Pie chart shows ethnic distribution of women who underwent breast reconstruction after mastectomy (n = 241).
Fig. 4 Bar chart shows proportion (no. [%]) of women who underwent breast reconstruction after mastectomy by year during the study period (n = 993).
Fig. 5 Bar chart shows proportion (no. [%]) of women who underwent breast reconstruction after mastectomy within each ethnic group (n = 993).
Fig. 6 Bar chart shows proportion (no. [%]) of women who used autologous tissue (versus implants) for breast reconstruction within each ethnic group (n = 241).
Fig. 7 Graph shows age distribution at cancer diagnosis of women who underwent breast reconstruction (median age = 46 years) (n = 241).
Fig. 8 Chart shows age at cancer diagnosis of women who underwent breast reconstruction by ethnicity.